

REMARKS

Claims 2 and 4 are active, and claim 5 was withdrawn from consideration.

A substitute specification is required in proper idiomatic English and in compliance with 37 CFR 1.52(a) and (b). The disclosure is objected to. Claim 4 is objected to as having informalities. Claim 2 is rejected under 35 USC 103a as being unpatentable over Wood (US Patent 5,733,399), and is rejected under 35 USC 103a over Ndebi et al. (US Patent 6,217,964) in view of Bliss (US Patent 3,964,846). Claim 4 is rejected under 35 USC 103a as being unpatentable over Wood in view of Fujiwara et al. (US Patent 5,630,770), and is rejected under 35 USC 103a as being unpatentable over Ndebi et al. and Bliss, and further in view of Shindo et al. (US Patent 5,140,375).

Specification

Applicants thank the Examiner for his constructive comments. A substitute Specification, including an Abstract, is provided herein under 37 CFR 1.125(b) and (c), which contains no new matter. The substitute Specification includes changes to correct the idiomatic English per paragraph 4 of the Office Action and to correct the informalities specified in paragraph 5 of the Office Action. Applicants believe that the Specification is now in proper form and the basis of the objection should be withdrawn.

Claim Objections

Claim 4 has been amended to correct the following informality specified in paragraph 6 of the Office Action, which requires replacement of the term "The manufacturing method of the belt", with "The method of manufacturing a belt". Applicants believe that the objection to claim 4 based on informalities has been remedied. This basis of rejection should be withdrawn.

The Substantive Rejections under 103(a)

Claim 2 rejection over Wood ('399)

Claim 2 calls for:

forming a solid rubber sheet;
laying said solid rubber sheet onto a seamless substrate film;
abutting both ends of said rubber sheet to form a cylindrical composite;
placing said cylindrical composite between an outer casing mold and a core mold where either said solid rubber sheet or said seamless substrate film faces radially inwardly; and
applying a pneumatic pressure to said cylindrical composite for vulcanizing said rubber sheet and for adhering said rubber sheet to said substrate film to form a one piece laminated cylinder.

The abutting step, and the step of applying pneumatic pressure to both vulcanize the rubber sheet and adhere the rubber sheet to the substrate film to form a one piece laminated cylinder are both missing from the Wood ('399) disclosure. As explained in the specification of the present invention, the

preferred embodiment of the claimed invention includes both cut ends of a cut rubber sheet butted together and bonded to a seamless film so as to form a cylindrical shape (specification, (step S3)). Further, the preferred embodiment includes applying pneumatic pressure by expanding an air bag to form the solid rubber and the resin film into one piece (original specification, paragraph [00019]).

Wood does not explicitly disclose, as discussed above, nor does it teach or suggest the claimed invention. Wood teaches a manufacturing method of a drive belt (or timing belt), which employs a "transfer molding" (Wood, col. 6, lines 45-54; and col. 3, line 15) which is an intermediary molding method between compression molding and injection molding. Layered raw materials consisting of the tooth facing fabric 84, the belt tensile member cord 88, the tooth stock elastomer 92, the barrier layer 94 and top elastomer 98, are placed between mold rings 12 and the mandrel 60 and pressed outwardly while heating (the transfer molding process), so that the finished drive belt is obtained (Wood, Figs. 8A, 8B; col. 6, line 65; and col. 7, line 4; col. 8, lines 24-32). Wood does not teach or suggest the abutting step, and the step of applying pneumatic pressure to both vulcanize the rubber sheet and adhere the rubber sheet to the substrate film to form a one piece laminated cylinder.

More specifically, Wood does not teach or suggest applying pneumatic pressure to the cylindrical composite for vulcanizing the rubber sheet and for adhering the rubber sheet to the substrate film to form a one piece laminated cylinder. Wood teaches a pressing means for pressing the slab or uncured belt

38 against the mold rings 12 is an inflatable diaphragm 40 (Wood, col. 5, lines 40-43). Thus, Wood does not teach the claimed step as recited above.

The Office Action refers to col. 1, lines 30-34, in the Wood patent. This section refers to elastomers and is silent as to vulcanizing and abutting a rubber sheet to a film. The Office Action refers to a) col. 2, lines 62-65, b) col. 5, lines 43-45, c) col. 6, lines 65-67, and col. 7, lines 1-7. (a) refers to a mandrel. (b) refers to a diaphragm in the mold, and (c) and (d) refer to various layers and not to a rubber sheet that is abutted and laminated to a film. This section relates to a barrier method of transfer molding. The barrier transfer molding is more complex and costly as compared to the claim 2 process. It includes more layers and steps and thus does not disclose what is claimed. Wood does not go so far.

The Office Action concedes that Wood does not explicitly disclose the ends of each component as abutted together, nor disclose forming the lay-up prior to placing the components on the mandrel. The Office Action states that it is intrinsic to Wood and obvious for one of ordinary skill in the art that the ends are abutted together to form an endless drive belt. Applicant has explained above that the abutting step is missing from Wood. Further, the Office Action states that it would have been well within the purview of one of ordinary skill in the art at the time the invention was made to form the lay-up prior to placing the components on the mandrel or by directly placing the components on the mandrel as both techniques were known and obvious to one in the art for forming a belt lay-up and only the expected results would be achieved. Applicants believe that the

combining of the claimed materials, i.e., laying the solid rubber sheet onto a seamless substrate film, before placing them on a cylindrical composite between an outer casing mold and a core mold is not disclosed by Wood. The conclusion that to form the lay-up prior to placing the components on the mandrel is obvious to one of ordinary skill in the art is not based on any reference cited of record and is not derived from the teaching or motivation from Wood. The reference must provide an objective reason or desirability to modify the teaching of the reference MPEP 2143. The teaching to modify Wood is from Applicant's disclosure, not the Wood reference, and thus is improper.

Applicant's further believe the conclusions to be improper because expected results are not a test of obviousness. All limitations must be considered (MPEP 2143.03). If the Examiner persists in this aspect of the rejection, he is respectfully requested to supply a reference or an affidavit as to his personal knowledge as required by 37 CFR 1.104(d), as to the abutting step, and the lay-up prior to placing the components on the mandrel.

A *prima facie* case for obviousness of Wood has not been established. To establish a *prima facie* case for obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (MPEP 2143.03). MPEP 2143.01 states that the fact that references can be combined or modified is not sufficient to establish *prima facie* obviousness, and the fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. The MPEP states that the prior art need

also suggest the desirability of the modification or combination. Further, the MPEP states that it is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. The Wood reference does not teach or suggest the claimed invention as claimed in claim 2. Thus, a prima facie case for obviousness has not been met since Wood does not teach or suggest the desirability, nor an objective reason to modify the reference to arrive at the claimed invention.

For example, Fig. 8A in Wood shows the configuration of equipment and belt component prior to the transfer molding process, and Fig. 8B shows the configuration of those structures and components after the transfer molding process has been completed (Wood, col. 6, lines 59-63). Wood does not teach or disclose abutting both ends of the rubber sheet to form a cylindrical composite as claimed, and as explained by way of example in the specification at step 3. The Examiner has not provided any prior art reference which discloses this abutting step.

Further, Wood does not provide the motivation for one skilled in the art to modify Wood to arrive at the present invention as required in MPEP 2143.01. Woods discloses that one of the key features of his invention is the fact that the belts are made via a transfer molding process as opposed to compression or injection molding (Wood, col. 6, lines 45-47). Thus, Wood teaches away from the claimed invention's use of applying pneumatic pressure to the cylindrical composite. Moreover, Wood states that one of the important features of his

invention is the fact that the building mandrel 60 upon which the unvulcanized belt 38 has been constructed is fitted with the diaphragm 40 and is capable of being placed into the mold assembly 26 (Wood, col. 5, lines 50-55). The problems and solutions taught in Wood do not provide the motivation for one of ordinary skill in the art to modify Wood to arrive at the claimed invention. The claimed invention is directed to the problem of low stretchability in belts (original specification, paragraph [0002]. Thus, one of ordinary skill in the art would not find the motivation in Wood to modify Wood to arrive at the present invention, especially since Wood teaches away from the use of compression molding, stating that transfer molding process is a key feature of the invention (Wood, col. 6, lines 45-47).

Applicants therefore believe claim 2 to be allowable.

Claim 2 rejection over Ndebi ('964) in view of Bliss ('846)

Claim 2 calls for:

forming a solid rubber sheet;
laying said solid rubber sheet onto a seamless substrate film;
abutting both ends of said rubber sheet to form a cylindrical composite;
placing said cylindrical composite between an outer casing mold and a core mold where either said solid rubber sheet or said seamless substrate film faces radially inwardly; and
applying a pneumatic pressure to said cylindrical composite for vulcanizing said rubber sheet and for adhering said rubber sheet to said substrate film to form a one piece laminated cylinder.

Claim 2 calls for abutting both ends of the rubber sheet to form a cylindrical composite. Claim 2 also claims applying pneumatic pressure to both vulcanize the rubber sheet at its abutting ends and adhere the rubber sheet to the seamless substrate film in the same step, as described in detail above with respect to the Wood reference. Also as discussed above with regard to the Wood reference, both the vulcanizing and the adhering lamination to the substrate film are performed simultaneously to these materials. The Ndebi reference is missing these claimed steps.

Ndebi teaches a layered endless belt for use in digital imaging system. The layered belt is constituted by the base elastomeric layer 40 which is formed by coating a elastomeric solution over the cylindrical mandrel 50, the intermediate polymer ply 42 (e.g. fabric layer) which is applied over the base elastomeric layer 40, and the outer elastomeric layer 44 which is formed by applying the elastomeric solution over the intermediate polymer ply 42. The layered belt is cured (Ndebi, Col. 6, lines 44-48). After the layered endless belt is cured, the cured belt is ground for finishing its surface (Ndebi, Fig. 7; col. 5, line 66; col. 6, line 51.) Thus, Ndebi does not disclose the claimed steps of applying pneumatic pressure to both vulcanize the rubber sheet abutting at its ends, and adhere the rubber sheet to the seamless substrate film.

The Office Action states that Ndebi does not specifically recite using an outer casing mold having a pneumatic chamber for applying pressure. The Office

Action states that it would have been well within the purview of one of ordinary skill in the art at the time the invention was made to use as the outer casing mold taught by Ndebi an outer casing mold having a pneumatic chamber as this was well known alternative in the art for applying vulcanization pressure when vulcanizing a belt as shown for example by Bliss and only expected results would be achieved. The Office Action further states that Ndebi does not specifically recite forming the lay-up prior to placing the components on the mandrel, but that it would have been well within the purview of one of ordinary skill in the art at the time the invention was made to form the lay-up prior to placing the components on the mandrel or by directly placing the components on the mandrel as both techniques were well known and obvious to one in the art and only the expected results would be achieved.

As discussed above, expected results are not a test of obviousness, and all limitations must be considered (MPEP 2143.03). The fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish prima facie obviousness (MPEP 2143.01). The Examiner's conclusion is improper. Applicants, again respectfully request the Examiner to supply a reference or an affidavit as to his personal knowledge as required by 37 CFR 1.104(d) as to the outer casing mold having a pneumatic chamber for applying pressure, and forming the lay-up prior to placing the components on the mandrel.

Bliss does not remedy the deficiencies of Ndebi. Bliss does not disclose

the claimed pneumatic pressure both vulcanizing the rubber sheet at its abutting ends and adhering the rubber sheet to the seamless substrate film in the same step. In contrast to Bliss, in the claimed invention both the vulcanizing and the adhering lamination to the substrate film are performed simultaneously to these materials.

More specifically, the Bliss reference discloses the uncured belt sleeve is vulcanized under steam pressure after it is manufactured in a conventional manner. However, Bliss does not disclose a lamination that is executed during the vulcanization. The Bliss reference (col. 3, lines 37-41) states that the belt to be cured is first built up in the usual manner as a belt sleeve. No seamless film is disclosed to which a solid rubber sheet is adhered while at the same time vulcanizing the sheet ends together to form an endless belt, as in the claimed invention.

Thus, Bliss and Ndebi do not disclose or teach the subject matter of claim 2. To establish a *prima facie* case for obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (MPEP 2143.03). Therefore, a *prima facie* case for obviousness has not been established. Applicants thereby believe claim 2 is allowable.

Claim 4

Claim 4 is rejected in paragraphs 8 and 10 under 35 USC 103a, as first (in paragraph 8) being obvious over Wood as applied to claim 1 and further in view of

Fujiwara et al. (US Patent 5,630,770), and second (in paragraph 10) as being obvious over Ndebi et al. and Bliss as applied in paragraph 9, and further in view of Shindo et al. (US Patent 5,140,375).

Claim 4 is dependent on claim 2 and thereby incorporates all of the subject matter claimed in claim 4, and is therefore believed unobvious over Wood for at least the same reasons as stated above in regard to claim 2 being unobvious over Wood. Similarly, Ndebi and Bliss are cited as disclosing equivalent steps as Wood, i.e., Ndebi having a method for manufacturing an endless, seamless image transfer belt, and Bliss supplying the vulcanizing step. As discussed above, Applicants believe the subject matter of claim 2 to be unobvious over all three of these references, e.g., the abutting step, and the vulcanizing and lamination step as discussed above in regard to claim 2 being unobvious over Ndebi in view of Bliss.

The Office Action cites Fujiwara and Shindo as disclosing the subject matter of dependent claim 4. However, neither of these references supply what is missing in Wood, Ndebi, or Bliss. As stated above, to establish a *prima facie* case for obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (MPEP 2143.03). A *prima facie* case for obviousness has not been established since none of the reference alone or in combination disclose the claimed invention in claim 4. Therefore, Applicants believe claim 4 to be allowable.

For the reasons given, claims 2 and 4 are believed to be in condition for

allowance, and such favorable action is hereby solicited.

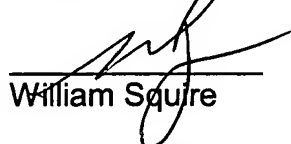
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[001] 201968v2

Amendments to th Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims:

1 (Canceled).

2 (Previously Presented). A method for manufacturing a belt comprising the steps of:

forming a solid rubber sheet;

laying said solid rubber sheet onto a seamless substrate film;

abutting both ends of said rubber sheet to form a cylindrical composite;

placing said cylindrical composite between an outer casing mold and a core mold where either said solid rubber sheet or said seamless substrate film faces radially inwardly; and

applying a pneumatic pressure to said cylindrical composite for vulcanizing said rubber sheet and for adhering said rubber sheet to said substrate film to form a one piece laminated cylinder.

3(Canceled).

4 (Currently Amended). The method of manufacturing a belt ~~The manufacturing method of the belt~~ according to claim 2 ~~including~~ including forming a coated layer on the outer surface of said laminated one piece cylinder.

5 (Withdrawn). A manufacturing apparatus of a belt comprising:

a cylindrical outer casing mold;

an inner core mold;

an air bag for applying a pneumatic pressure to a laminated cylinder comprising a solid rubber and a seamless substrate from the outside of said core mold; and

a vulcanizing chamber for vulcanizing said cylindrical solid rubber and for adhering said cylindrical solid rubber to said cylindrical substrate so as to form the laminated cylinder in one piece.



Substitute Specification (marked-up version):

Please find below the original Specification including the Abstract marked-up to show the current changes:

A METHOD FOR MANUFACTURING A METHOD OF BELT
AND MANUFACTURING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

[0029] The present invention relates to a manufacturing method of belts applicable to intermediate transfer belts or fixing belts for copying machines, printers and so forth, and relates to a manufacturing apparatus of these belts.

Brief Description of the Related Art

[0030] In electro-photographic copying machines and printers, belts are used for transferring or fixing toners. Usually, these belts are formed out of resins with a low stretchability and sometimes they bear coated layers.

[0031] Since the above-mentioned conventional belts are usually formed out of only resins with no elastic layers, their shapes and sizes are limited, consequently, their applicable areas are limited.

SUMMARY OF THE INVENTION

[0032] The present invention is carried out in view of the above-mentioned problems and its objective is to provide a method for the manufacturing a belt method of belts having no limitations in their shapes and sizes, but with high quality, ~~and also to provide the manufacturing apparatus of them.~~

~~[005] The manufacturing method and apparatus of belts according to the present invention are arranged as follows.~~

[006] (1) ~~A manufacturing method of a belt comprising steps of: forming a solid rubber into a sheet form; adhering the solid rubber sheet to a substrate with small stretchability so as to form into a laminated film; and forming the laminated film into a seamless cylinder so as to be formed in one piece.~~

[007] (2) ~~A manufacturing method of a belt comprising steps of: forming a solid~~

~~rubber into a sheet form; forming the solid rubber sheet and a seamless substrate film into a laminated cylindrical shape; placing the laminated cylinder between an outer casing mold and a core mold where either of the solid rubber sheet or the seamless substrate film is facing inside; and applying a pneumatic pressure to said laminated cylinder for vulcanizing said solid rubber sheet and for adhering the solid rubber sheet to the substrate so as to form said laminated cylinder in one piece.~~

[0033] An aspect of the present invention includes a method for manufacturing a belt comprising the steps of, forming a solid rubber sheet, laying the solid rubber sheet onto a seamless substrate film, abutting both ends of the rubber sheet to form a cylindrical composite, and placing the cylindrical composite between an outer casing mold and a core mold where either the solid rubber sheet or the seamless substrate film faces radially inwardly. The method further includes applying a pneumatic pressure to the cylindrical composite for vulcanizing the rubber sheet and for adhering the rubber sheet to the substrate film to form a one piece laminated cylinder.

~~**[008][0034]** (3) The manufacturing~~ In a further aspect of the method of ~~for manufacturing the belt according to (1) or (2) wherein a coated layer is formed on the outer surface of the said belt.~~

~~**[009][0035]** (4.) A manufacturing apparatus of a belt comprising: a cylindrical outer~~

~~easing mold; an inner core mold; an air bag for applying a pneumatic pressure to a laminated cylinder comprising a solid rubber and a seamless substrate from the outside of the core mold; and a vulcanizing room for vulcanizing the cylindrical solid rubber and for adhering the cylindrical solid rubber to the cylindrical substrate so as to form the laminated cylinder in one piece.~~

BRIEF DESCRIPTION OF DRAWINGS

[0010][0036] FIG.1 is a cross-sectional view showing an outline arrangement of a vulcanizing apparatus according to an embodiment of the present invention.

[0011][0037] FIG.2 is a perspective view illustrating a state where both ends of a rubber sheet and a seamless resin film are laminated and butted so as to be formed into a one piece cylindrical body.

[0012][0038] FIG.3 is a flow chart showing a manufacturing process of the embodiment.

[0013][0039] FIG.4 is a chart showing characteristic data of a product according to the present embodiment.

[0014][0040] FIG.5 shows cross-sectional views of belts according to the present embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0015][0041] Hereinafter the embodiment according to the present invention is described by referring to drawings. In the present embodiment, the manufacturing method and apparatus of intermediate transfer belts and fixing belts used in color copying machines, color printers and the like are explained.

[0016][0042] FIG.1 is the cross-sectional view showing the outline arrangement of the vulcanizing apparatus used in manufacturing the belt according to the present embodiment.

[0017][0043] In the figure, reference numerals "1" is a base plate placed on the bottom of the apparatus, "2" is an outer casing mold as a cylindrical outer die and "3" is a core mold as an inner die. A reference numeral "4" is an air bag for applying a pneumatic pressure from outside of the core mold 3 to an unvulcanized rubber 5 as a cylindrical solid sheet and a resin ~~rein~~-film 6 as a cylindrical seamless sheet base, arranged between the outer casing mold 2 and the core mold 3. A reference numeral "7" is a vulcanizing chamber ~~room~~-for vulcanizing the unvulcanized rubber 5 and adhering it to the resin ~~rein~~ film 6 so as to be formed in one piece by applying the pneumatic pressure from the air bag 4.

[0018][0044] In the present embodiment, the resin film 6 with low elasticity, namely, not stretchable or hard to stretch, is used as a substrate and rubber

elastic layers are applied to either the outer side, the inner side, or both sides of the resin film, consequently to be formed in one piece. The solid rubber is used for these elastic layers, but however liquid or paste rubber is not used for these elastic layers. The applied pneumatic pressure generated by expanding the air bag 4 forms the solid rubber and the resin film into one piece.

[0019][0045] The unvulcanized rubber 5 precisely formed in a sheet form by calender rollers and the like is used as a substrate for the belt. Since the vulcanized rubber belt bears smooth surfaces attributed to the forming method, the belt is employable without polishing. And a dispersion value in the thickness of the belt can be kept less than 0.4mm.

[0020][0046] A manufacturing procedure of the intermediate transfer belt is explained step by step by referring to a process chart shown in FIG.3.

[0021][0047] (Step S1) A CR rubber is formed into a sheet by calender rollers. Dimensions of the sheet, for example, are as follows: Width: 400mm; Thickness: 0.48 ± 0.02 mm.

[0022][0048] (Step S2) The sheet rubber is cut in a predetermined length, for example, 528 ± 1 mm.

[0023][0049] (Step S3) The cut rubber sheet and a seamless film are laminated and both cut ends of cut rubber sheet are butted together with a seamless film so as to form a cylindrical shape. A distance "t" between both ends of the rubber

sheet is kept 0 to 2mm as shown in FIG._2 so as to keep uniform thickness all over the cylindrically shaped rubber sheet.

[0024][0050] (Step S4) The butted cylindrical unvulcanized rubber is placed in the vulcanizing apparatus shown in FIG.1 and vulcanized.

[0025][0051] (Step S5) The Outer surface of the vulcanized cylindrical rubber is coated by spraying a fluoride coating material with thickness by 6μ and baked.

[0026][0052] (Step S6) Both ends of the coated and baked cylindrical rubber is trimmed, thus the intermediate transfer belt with predetermined dimensions is obtained.

[0027][0053] Properties of the belt obtained by the above-mentioned procedure are shown in FIG.4.

[0028][0054] The present embodiment can provide the belt with high quality without any limitations in its shape and dimension.

[0029][0055] Any seamless film can be used as the substrate without any limitations in materials and dimensions. A plain weave fabric can also be used as the substrate in place of the resin film. Any rubber material can be used as a sheet material for the belt.

[0030][0056] The vulcanizing apparatus is capable of manufacturing belts (a) to (d) depicted in FIG.5. In belt (a) a rubber layer is arranged at the outside of the belt. In belt (b) a rubber layer is arranged at the inside of the belt. In belt (c)

rubber layers are arranged at both sides of the belt. The apparatus is also capable of manufacturing belt (d) formed out of only the rubber.

[0034][0057] As explained above, the present invention can easily provide the belt with high quality without any limitations in its shape and dimension.



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ABSTRACT OF THE DISCLOSURE

The objective of the present invention is to provide a method and apparatus for manufacturing an intermediate transfer belt and a fixing belt with high quality used in copying machines, printers and the like.

An unvulcanized rubber is formed into a sheet ~~form~~ and adhered to a resin film with low stretchability ~~for~~ forming a seamless laminate. ~~laminated film~~. The laminate ~~laminated film~~ is formed into a cylindrical form where the solid rubber sheet is arranged outside of the resin film or vice versa. The ~~laminated cylinder~~ cylindrical composite is placed between an outer casing mold and a core mold. A pneumatic pressure is applied to the ~~laminated cylinder~~ cylindrical composite outside of the core mold for vulcanizing the rubber and ~~adhere~~ adhering the rubber to the resin film so as to form ~~the~~ a laminated cylinder into one piece.